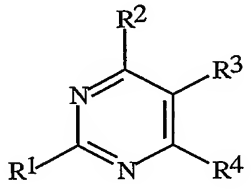
CLAIMS

What is claimed is:

1. A compound selected from Formula **I**, an *N*-oxide or an agriculturally suitable salt thereof,



I

wherein

R^1 is cyclopropyl optionally substituted with 1–5 R^5, isopropyl optionally substituted with 1–5 R^6, or phenyl optionally substituted with 1–3 R^7;

R^2 is $((O)_jC(R^{15})(R^{16}))_kR$;

R is CO_2H or a herbicidally effective derivative of CO_2H;

R^3 is halogen, cyano, nitro, OR^{20}, SR^{21} or $N(R^{22})R^{23}$;

R^4 is $-N(R^{24})R^{25}$ or $-NO_2$;

each R^5 and R^6 is independently halogen, C_1–C_6 alkyl, C_1–C_6 haloalkyl, C_2–C_6 alkenyl, C_2–C_6 haloalkenyl, C_1–C_3 alkoxy, C_1–C_2 haloalkoxy, C_1–C_3 alkylthio or C_1–C_2 haloalkylthio;

each R^7 is independently halogen, cyano, nitro, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_6 cycloalkyl, C_3–C_6 halocycloalkyl, C_1–C_4 hydroxyalkyl, C_2–C_4 alkoxyalkyl, C_2–C_4 haloalkoxyalkyl, C_2–C_4 alkenyl, C_2–C_4 haloalkenyl, C_3–C_4 alkynyl, C_3–C_4 haloalkynyl, hydroxy, C_1–C_4 alkoxy, C_1–C_4 haloalkoxy, C_2–C_4 alkenyloxy, C_2–C_4 haloalkenyloxy, C_3–C_4 alkynyloxy, C_3–C_4 haloalkynyloxy, C_1–C_4 alkylthio, C_1–C_4 haloalkylthio, C_1–C_4 alkylsulfinyl, C_1–C_4 haloalkylsulfinyl, C_1–C_4 alkylsulfonyl, C_1–C_4 haloalkylsulfonyl, C_2–C_4 alkenylthio, C_2–C_4 haloalkenylthio, C_2–C_4 alkenylsulfinyl, C_2–C_4 haloalkenylsulfinyl, C_2–C_4 alkenylsulfonyl, C_2–C_4 haloalkenylsulfonyl, C_3–C_4 alkynylthio, C_3–C_4 haloalkynylthio, C_3–C_4 alkynylsulfinyl, C_3–C_4 haloalkynylsulfinyl, C_3–C_4 alkynylsulfonyl, C_3–C_4 haloalkynylsulfonyl, C_1–C_4 alkylamino, C_2–C_8 dialkylamino, C_3–C_6 cycloalkylamino, C_4–C_6 (alkyl)cycloalkylamino, C_2–C_6 alkylcarbonyl, C_2–C_6 alkoxycarbonyl, C_2–C_6 alkylaminocarbonyl, C_3–C_8 dialkylaminocarbonyl, C_3–C_6 trialkylsilyl, phenyl, phenoxy and 5- or 6-membered heteroaromatic rings, each phenyl, phenoxy and 5- or 6-membered heteroaromatic ring optionally substituted with one to three substituents independently selected from R^{45}; or

two adjacent R^7 are taken together as $-OCH_2O-$, $-CH_2CH_2O-$, $-OCH(CH_3)O-$, $-OC(CH_3)_2O-$, $-OCF_2O-$, $-CF_2CF_2O-$, $-OCF_2CF_2O-$ or $-CH=CH-CH=CH-$;

R^{15} is H, halogen, C_1–C_4 alkyl, C_1–C_4 haloalkyl, hydroxy, C_1–C_4 alkoxy or C_2–C_4 alkylcarbonyloxy;

R^{16} is H, halogen, C_1–C_4 alkyl or C_1–C_4 haloalkyl; or

R^{15} and R^{16} are taken together as an oxygen atom to form, with the carbon atom to which they are attached, a carbonyl moiety;

R^{20} is H, C_1–C_4 alkyl or C_1–C_3 haloalkyl;

R^{21} is H, C_1–C_4 alkyl or C_1–C_3 haloalkyl;

R^{22} and R^{23} are independently H or C_1–C_4 alkyl;

R^{24} is H, C_1–C_4 alkyl optionally substituted with 1–2 R^{30}, C_2–C_4 alkenyl optionally substituted with 1–2 R^{31}, or C_2–C_4 alkynyl optionally substituted with 1–2 R^{32}; or R^{24} is $C(=O)R^{33}$, nitro, OR^{34}, $S(O)_2R^{35}$, $N(R^{36})R^{37}$ or $N=C(R^{62})R^{63}$;

R^{25} is H, C_1–C_4 alkyl optionally substituted with 1–2 R^{30} or $C(=O)R^{33}$; or

R^{24} and R^{25} are taken together as a radical selected from $-(CH_2)_4-$, $-(CH_2)_5-$, $-CH_2CH=CHCH_2-$ and $-(CH_2)_2O(CH_2)_2-$, each radical optionally substituted with 1–2 R^{38}; or

R^{24} and R^{25} are taken together as $=C(R^{39})N(R^{40})R^{41}$ or $=C(R^{42})OR^{43}$;

each R^{30}, R^{31} and R^{32} is independently halogen, C_1–C_3 alkoxy, C_1–C_3 haloalkoxy, C_1–C_3 alkylthio, C_1–C_3 haloalkylthio, amino, C_1–C_3 alkylamino, C_2–C_4 dialkylamino or C_2–C_4 alkoxycarbonyl;

each R^{33} is independently H, C_1–C_{14} alkyl, C_1–C_3 haloalkyl, C_1–C_4 alkoxy, phenyl, phenoxy or benzyloxy;

R^{34} is H, C_1–C_4 alkyl, C_1–C_3 haloalkyl or $CHR^{66}C(O)OR^{67}$;

R^{35} is C_1–C_4 alkyl or C_1–C_3 haloalkyl;

R^{36} is H, C_1–C_4 alkyl or $C(=O)R^{64}$;

R^{37} is H or C_1–C_4 alkyl;

each R^{38} is independently halogen, C_1–C_3 alkyl, C_1–C_3 alkoxy, C_1–C_3 haloalkoxy, C_1–C_3 alkylthio, C_1–C_3 haloalkylthio, amino, C_1–C_3 alkylamino, C_2–C_4 dialkylamino or C_2–C_4 alkoxycarbonyl;

R^{39} is H or C_1–C_4 alkyl;

R^{40} and R^{41} are independently H or C_1–C_4 alkyl; or

R^{40} and R^{41} are taken together as $-(CH_2)_4-$, $-(CH_2)_5-$, $-CH_2CH=CHCH_2-$ or $-(CH_2)_2O(CH_2)_2-$;

R^{42} is H or C_1–C_4 alkyl;

R^{43} is C_1–C_4 alkyl;

each R^{45} is independently halogen, cyano, nitro, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_3–C_6 cycloalkyl, C_3–C_6 halocycloalkyl, C_2–C_4 alkenyl, C_2–C_4 haloalkenyl, C_3–C_4

alkynyl, C_3–C_4 haloalkynyl, C_1–C_4 alkoxy, C_1–C_4 haloalkoxy, C_1–C_4 alkylthio, C_1–C_4 haloalkylthio, C_1–C_4 alkylsulfinyl, C_1–C_4 alkylsulfonyl, C_1–C_4 alkylamino, C_2–C_8 dialkylamino, C_3–C_6 cycloalkylamino, C_4–C_6 (alkyl)cycloalkylamino, C_2–C_4 alkylcarbonyl, C_2–C_6 alkoxycarbonyl, C_2–C_6 alkylaminocarbonyl, C_3–C_8 dialkylaminocarbonyl or C_3–C_6 trialkylsilyl;

R^{62} is H, C_1–C_4 alkyl or phenyl optionally substituted with 1–3 R^{65};

R^{63} is H or C_1–C_4 alkyl; or

R^{62} and R^{63} are taken together as $-(CH_2)_4-$ or $-(CH_2)_5-$;

R^{64} is H, C_1–C_{14} alkyl, C_1–C_3 haloalkyl, C_1–C_4 alkoxy, phenyl, phenoxy or benzyloxy;

each R^{65} is independently CH_3, Cl or OCH_3;

R^{66} is H, C_1–C_4 alkyl or C_1–C_4 alkoxy;

R^{67} is H, C_1–C_4 alkyl or benzyl;

j is 0 or 1; and

k is 0 or 1;

provided that:

(a) when k is 0, then j is 0;

(b) when R^2 is CH_2OR^a wherein R^a is H, optionally substituted alkyl or benzyl, then R^3 is other than cyano;

(c) when R^1 is phenyl substituted by Cl in each of the meta positions, the phenyl is also substituted by R^7 in the para position;

(d) when R^1 is phenyl substituted by R^7 in the para position, said R^7 is other than *tert*-butyl, cyano or optionally substituted phenyl;

(e) when R^1 is cyclopropyl or isopropyl optionally substituted with 1–5 R^6, then R is other than $C(=W)N(R^b)S(O)_2-R^c-R^d$ wherein W is O, S, NR^e or NOR^e; R^b is hydrogen, C_1–C_4 alkyl, C_2–C_6 alkenyl or C_2–C_6 alkynyl; R^c is a direct bond or CHR^f, O, NR^e or NOR^e; R^d is an optionally substituted heterocyclic or carbocyclic aromatic radical having 5 to 6 ring atoms, the radical being optionally condensed with an aromatic or nonaromatic 5- or 6-membered ring; each R^e is independently H, C_1–C_3 alkyl, C_1–C_3 haloalkyl or phenyl; and R^f is H, C_1–C_3 alkyl or phenyl; and

(f) the compound of Formula **I** is other than diethyl 6-amino-5-nitro-2-phenyl-4-pyrimidinemalonate.

2. The compound of Claim 1 wherein

R^2 is CO_2R^{12}, CH_2OR^{13}, $CH(OR^{46})(OR^{47})$, CHO, $C(=NOR^{14})H$, $C(=NNR^{48}R^{49})H$, $(O)_jC(R^{15})(R^{16})CO_2R^{17}$, $C(=O)N(R^{18})R^{19}$, $C(=S)OR^{50}$, $C(=O)SR^{51}$, $C(=S)SR^{52}$ or $C(=NR^{53})YR^{54}$;

R^{12} is H, -CH[C(O)O$(CH_2)_m$]-, -N=C(R^{55})R^{56}; or a radical selected from C_1–C_{14} alkyl, C_3–C_{12} cycloalkyl, C_4–C_{12} alkylcycloalkyl, C_4–C_{12} cycloalkylalkyl, C_2–C_{14} alkenyl, C_2–C_{14} alkynyl and phenyl, each radical optionally substituted with 1–3 R^{27}; or

R^{12} is a divalent radical linking the carboxylic ester function CO_2R^{12} of each of two pyrimidine ring systems of Formula **I**, the divalent radical selected from -CH_2-, -$(CH_2)_2$-, -$(CH_2)_3$- and -$CH(CH_3)CH_2$-;

R^{13} is H, C_1–C_{10} alkyl optionally substituted with 1–3 R^{28}, or benzyl;

R^{14} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl or benzyl;

R^{17} is C_1–C_{10} alkyl optionally substituted with 1–3 R^{29}, or benzyl;

R^{18} is H, C_1–C_4 alkyl, hydroxy, C_1–C_4 alkoxy or $S(O)_2R^{57}$;

R^{19} is H or C_1–C_4 alkyl;

each R^{27} is independently halogen, cyano, hydroxycarbonyl, C_2–C_4 alkoxycarbonyl, hydroxy, C_1–C_4 alkoxy, C_1–C_4 haloalkoxy, C_1–C_4 alkylthio, C_1–C_4 haloalkylthio, amino, C_1–C_4 alkylamino, C_2–C_4 dialkylamino, -CH[O$(CH_2)_n$]- or phenyl optionally substituted with 1–3 R^{44}; or

two R^{27} are taken together as -OC(O)O- or -O(C(R^{58})(R^{58}))$_{1-2}$O-; or

two R^{27} are taken together as an oxygen atom to form, with the carbon atom to which they are attached, a carbonyl moiety;

each R^{28} is independently halogen, C_1–C_4 alkoxy, C_1–C_4 haloalkoxy, C_1–C_4 alkylthio, C_1–C_4 haloalkylthio, amino, C_1–C_4 alkylamino or C_2–C_4 dialkylamino; or

two R^{28} are taken together as an oxygen atom to form, with the carbon atom to which they are attached, a carbonyl moiety;

each R^{29} is independently halogen, C_1–C_4 alkoxy, C_1–C_4 haloalkoxy, C_1–C_4 alkylthio, C_1–C_4 haloalkylthio, amino, C_1–C_4 alkylamino or C_2–C_4 dialkylamino;

each R^{44} is independently halogen, C_1–C_4 alkyl, C_1–C_3 haloalkyl, hydroxy, C_1–C_4 alkoxy, C_1–C_3 haloalkoxy, C_1–C_3 alkylthio, C_1–C_3 haloalkylthio, amino, C_1–C_3 alkylamino, C_2–C_4 dialkylamino or nitro;

R^{46} and R^{47} are independently C_1–C_4 alkyl or C_1–C_3 haloalkyl; or

R^{46} and R^{47} are taken together as -CH_2CH_2-, -$CH_2CH(CH_3)$- or -$(CH_2)_3$-;

R^{48} is H, C_1–C_4 alkyl, C_1–C_4 haloalkyl, C_2–C_4 alkylcarbonyl, C_2–C_4 alkoxycarbonyl or benzyl;

R^{49} is H, C_1–C_4 alkyl or C_1–C_4 haloalkyl;

R^{50}, R^{51} and R^{52} are H; or a radical selected from C_1–C_{14} alkyl, C_3–C_{12} cycloalkyl, C_4–C_{12} alkylcycloalkyl, C_4–C_{12} cycloalkylalkyl, C_2–C_{14} alkenyl and C_2–C_{14} alkynyl, each radical optionally substituted with 1–3 R^{27};

Y is O, S or NR^{61};

R^{53} is H, C_1–C_3 alkyl, C_1–C_3 haloalkyl, C_2–C_4 alkoxyalkyl, OH or C_1–C_3 alkoxy;

R^{54} is C_1–C_3 alkyl, C_1–C_3 haloalkyl or C_2–C_4 alkoxyalkyl; or

R^{53} and R^{54} are taken together as $-(CH_2)_2-$, $-CH_2CH(CH_3)-$ or $-(CH_2)_3-$;

R^{55} and R^{56} are independently C_1–C_4 alkyl;

R^{57} is C_1–C_4 alkyl, C_1–C_3 haloalkyl or $NR^{59}R^{60}$;

each R^{58} is independently selected from H and C_1–C_4 alkyl;

R^{59} and R^{60} are independently H or C_1–C_4 alkyl;

R^{61} is H, C_1–C_3 alkyl, C_1–C_3 haloalkyl or C_2–C_4 alkoxyalkyl;

m is an integer from 2 to 3; and

n is an integer from 1 to 4.

3. The compound of Claim 2 wherein R^3 is halogen.

4. The compound of Claim 2 wherein R^1 is cyclopropyl or phenyl substituted with a halogen, methyl or methoxy radical in the para position and optionally with 1–2 radicals selected from halogen and methyl in other positions; and R^4 is $-N(R^{24})R^{25}$.

5. The compound of Claim 4 wherein R^2 is CO_2R^{12}, CH_2OR^{13}, CHO or $CH_2CO_2R^{17}$.

6. The compound of Claim 5 wherein R^{24} is H, $C(O)R^{33}$ or C_1–C_4 alkyl optionally substituted with R^{30}; R^{25} is H or C_1–C_2 alkyl; or R^{24} and R^{25} are taken together as $=C(R^{39})N(R^{40})R^{41}$.

7. The compound of Claim 6 wherein R^2 is CO_2R^{12}; and R^{24} and R^{25} are H.

8. The compound of Claim 7 wherein R^{12} is H, C_1–C_4 alkyl or benzyl.

9. The compound of Claim 1 selected from the group consisting of:
methyl 6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylate,
ethyl 6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylate,
phenylmethyl 6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylate,
6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylic acid monosodium salt,
methyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate,
phenylmethyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate,
6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylic acid monosodium salt,
ethyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate,
methyl 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylate,
ethyl 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylate,

6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylic acid,
ethyl 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylate,
methyl 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylate, and
6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylic acid.

10. A herbicidal mixture comprising a herbicidally effective amount of a compound of Claim 1 and an effective amount of at least one additional active ingredient selected from the group consisting of an other herbicide and a herbicide safener.

11. A herbicidal mixture comprising synergistically effective amounts of a compound of Claim 1 and an auxin transport inhibitor.

12. A herbicidal composition comprising a herbicidally effective amount of a compound of Claim 1 and at least one of a surfactant, a solid diluent or a liquid diluent.

13. A method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with a herbicidally effective amount of a compound of Claim 1.

14. A herbicidal composition comprising a herbicidally effective amount of a compound of Claim 1, an effective amount of at least one additional active ingredient selected from the group consisting of an other herbicide and a herbicide safener, and at least one of a surfactant, a solid diluent or a liquid diluent.